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CRITERIA FOR CHOICE OF CHARACTERS FOR CONSTRUCTION OF SELECTION INDICES IN GREENGRAM.

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Five genetic parameters viz. heritability (h^2), genetic advance (G A.), genotypic correlation of characters with yield (rg), h^2.rg and path-coefficient of the characters on yield (p) were estimated using 30 varieties of greengram (*Vigna radiata* Wilczek). Based on these parameters as the criteria five groups of 1 to 9 characters selection indices were constructed. Expected genetic gain in yield due to the indices were computed and their efficiency over direct selection for yield *per se* was assessed. In all the five groups the efficiency of the indices increased gradually with addition of characters to the indices. Combined direct and indirect selection was found to be more effective than indirect selection alone. The path-coefficient values of the characters on yield (p) was found to be the best criterian for choice of characters for construction of indices. The 6-character index based on pods/plant, 1000-seed wt., seeds, pods, reproductive period, clusters/plant, and yield/plant was found to be most efficient index in realising genetic advance in yield. Inclusion of characters like length of pod and plant height did not add much to the efficiency of indices.

Selection indices provide the means for making use of correlated characters for higher efficiency in selection for yield (Smith, 1938). Selection indices for yield and also for multiple economic traits have been worked out by several workers in wide range of crop plants, but in all these studies, efficiency of the indices have been assessed in terms of predicted genetic advance. These studies showed that all the characters are not of equal selection value for improvement in yield. In the absence of any specific objective criterian for choice of characters, a very large number of indices (with varying combinations of characters) are needed to be evaluated to find out the most efficient index. This study was undertaken to construct selection indices on the basis of some genetic criteria and to assess their efficiency over direct selection for yield *per se* in greengram and also to examine the usefulness of some possible criteria for choice of characters for constructing indices.

MATERIALS AND METHODS

The material for the present study consisted of 30 greengram varieties of diverse geographic and genetic origin. The trial was conducted during kharif 1978-79 in randomised complete block design with 4 replications.

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The plot size was 8 rows of 2.5 m with a 30 cm x 10 cm spacing. Observations were recorded on days to maturity, reproductive period (1st flowering to maturity), 1000-seed wt. (g) on plot basis and plant height (cm), clusters/plant pods/plant, seeds/pod, length of pod (cm) and yield/plant (g) on 10 random plants per plot. Heritability (h^2), genetic advance at 5% (GA.) of the characters were estimated using variance estimates following Al-Jibouri *et al.*, (1958). The genotypic correlations (r_g) of the charcters with yield were estimated following Robinson *et al.*, (1951). The path-coefficients (i. e. direct effect component) of these characters on yield (p) were estimated by path-analysis following Dewey and Lu (1959). Selection indices for yield (as the economic trait) were constructed and their efficiency over direct selectiCn for yield was assessed in terms of expected genetic advance in yield following Smith (1938).

Five groups of indices were evaluated, the characters being chosen on the bais of 5 different criteria, viz. (i) heritability (h^2), (ii) genetic advance (GA.), (iii) genotypic correlation with yield (r_g), (iv) h_g. r_g, (v) direct effect component of the characters on yield (p). The rational behind selection of these genetic parameters as criteria of character selection for the groups is that, r_g and p indicate the bearing of the characters on yield, whereas, h^2 and G.A. reflect the dependability of the characters in selection.

For set 'A' (indirect selection, where yield is not included for construction of indices], in each of the five groups, the single character index was based on the one having the highest absolute value for the criterian of choice for the group, and characters were added, one at a time in descending order of absolute value of the criterian (Table-1) till 1 to 8 character indirect selection indices were obtained. For set 'B' (combined direct and indirect selection) the groups and indices were made as done for set 'A', but yield was included in construction of each index in order to give 2 to 9 character indices Thus based on the estimates of h^2, GA. r_g, h^2. r_g, and p (Table-1) the sequence of addition of characters for the 5 groups of indices for both the sets were :

Set 'A' Group I : $X_8 + X_3 + X_5 + X_4 + X_1 + X_2 + X_6 + X_7$

Group II : $X_4 + X_5 + X_3 + X_8 + X_2 + X_7 + X_6 + X_1$

Group III : $X_5 + X_2 + X_4 + X_3 + X_1 + X_8 + X_7 + X_6$

Group IV : $X_5 + X_2 + X_3 + X_4 + X_1 + X_8 + X_7 + X_6$

Group V : $X_5 + X_8 + X_6 + X_2 + X_4 + X_7 + X_3 + X_1$

Set 'B' Group I : $X_9 + X_8 + X_3 + X_5 + X_4 + X_1 + X_2 + X_6 + X_7$

Group II : $X_9 + X_4 + X_5 + X_3 + X_8 + X_2 + X_7 + X_6 + X_1$

Group III : $X_9 + X_5 + X_2 + X_4 +$

Table - 1 : Heritability (h^2), genetic advance (G.A.) of yield components, their genotypic correlation with yield (rg) and direct efffect component on yield (p) in greengram

Characters	h^2	GA. (%)	rg	$h^2.rg$	p
X_1 Days to maturity	0.801	5.78	0.539	0.432	0.008
X_2 Reproductive period	0.800	13.58	0.742	0.594	0.090
X_3 Plant height	0.866	21.15	0.632	0.547	0.009
X_4 Clusters/plant	0.814	34.02	0.644	0.524	0.063
X_5 Pods/plant	0.858	33.92	0.824	0.707	0.816
X_6 Seeds/pod	0.723	8.24	—0.011	—0 008	0.234
X_7 Length of pod	0.678	8.96	0.210	0.142	0.015
X_8 1000-seed wt.	0.961	22.59	0 242	0.223	0.519
X_9 Yield/plant	0.743	21.06			

$X_3 + X_1 + X_8 + X_7 + X_6$

Group IV : $X_9 + X_5 + X_2 + X_3 + X_4 + X_1 + X_8 + X_7 + X_6$

Group V : $X_9 + X_5 + X_8 + X_6 + X_2 X_4 + X_7 + X_3 + X_1$

Genetic advance in yield (as the economic trait) using aelection indices were calculated after Smith *et al.*, (1938) and Ramanujam and Susil Kumar (1963). The relative efficiency of selection indices over direct selections were calculated as ratio of G.A. with use of selection indices and G.A. with selection for yield *per se* and is expressed in percentage (Sahu and Patnaik, 1980).

RESULTS AND DISCUSSION

Predicted genetic advance in yield for the different indices at 5% selection intensity for indirect selection (Set 'A') ranged from 0.270 to 0.877 g/plant (Table-2), whereas, those for combined direct and indirect selection (Set 'B') ranged from 0.751 to 0.894 g/plant (Table-3) against 0.740 g/plant for direct selection for yield *per se*. The predicted gain in efficiency from use of the indices over direct selection for yield *per se* ranged from-63.5 to 18.5% for set 'A' and 1.5% to 20.8% for set 'B'.

The average predicted advance over all the 8 indices of individual groups of both set 'A' and 'B' showed that group V (based on P-values) indices had the highest efficiency of 11.7% and 16.4% over direct selection followed by Group IV ($h^2.r_g$), Group III (r_g), Group II (GA) and Group I (h^2) indices. This showes that direct effect component (p-value) of the character on yield would be the most effective criterian for choice of characters for inclusion in selection indices followed by $h^2.r_g$, r_g and GA., while

h^2 is the least effective criterian Sahu and Patnaik (1980) evaluated 5 groups of indices based on 5 different criteria (viz. h^2 ,r_p , r_g , h^2 , r_p , h^2 r_g with 1 to 10 characters in niger and observed that h^2 .r_g would be the most effective criterian for choice of characters for inclusion in selection indices followed by r_g , while h_2 and r_p (Phenotypic correlation with yield) would be least effective.

For set 'A' (indirect selection) the average predicted advance for 1 to 8 character indices ranged from 73.5% to 118.5% over direct selection. Pods/plant formed the single character index in 3 groups, whereas, 1000-seed wt. and clusters/plant in one group each. In all these cases single character indices had lower efficiency than direct selection. For 2-character indices pods/plant came in 4 groups, whereas, 1000 seed wt. and reproductive period in 2 groups each. These 2-character indices had lower efficiency than direct selection in all groups except group-V, where the gain in efficiency by the index (pops/ plant and 1000 - seed wt.) was 5.4%. For 3 character indices the efficiency of group - V (pods / plant, 1000-seed wt. and seeds / pod) was 13.0 %, whereas, in other groups there was very little or no grain. The gain in efficiency went on gradually increasing with increase in number of characters in the indices in all the groups. A comparision of the individual indices of the 5 groups revealed that the indices of Group V (based on p-values) had invariably higher efficiency than other groups. The 5-character index in group V, based on pods / plant, 1000-seed wt , seeds / pods, reproductive period and clusters / plant had an efficency of 17.4%, out of total possible 20.8% in case of 9-character index. This shows that these characters are of high selection value for yield. Inclusion of characters like length of pod and plant ht in the indices does not add much to the efficiency, whereas, days to maturity adds 1.1% to the efficiency. This indicates that selections for length of pod and plant height are not efficient parameters for selection in yield, whereas, days in maturity have some selection value.

For set B' (combined direct and indirect selection) where yield is included in forming each of the indices, the average predicted genetic advance for 2 to 9 characters indices ranged from 0.779 to 0.894 g/plant with efficiency of 5.3 to 20.8% over direct selection. In each group the efficiency goes on increasing gradually with addition of characters to the indices. Like set 'A' in set 'B' the indices of Group V had higher efficiency than those of other groups. In this group the 4-character (yield / plant, pods / plant, 1000 - seed wt., seeds / pod) index had an efficiency of 15 9%. After the inclusion of 2 more characters (reproductive period and clusters / plant), the 6 - characters